

How to Grow Beetle Bait – Revisited!

By Jim Hyland, Alabama Forestry Commission

Over the last 30-some odd years, the Alabama Forestry Commission (AFC) has worked with landowners in controlling Southern Pine Beetle (SPB) infestations and has tried to encourage landowners to take the easy way by preventing the conditions needed to feed the beetle. All pine forest management plans that are produced by AFC foresters include SPB hazard ratings and information on how to prevent attack by beetles. The best way is, of course, when the stand is established to plant fewer pine trees per acre. No more than 500 trees per acre should be planted; 450 would be even better.

What about stands that already exist with 700-900 trees per acre? An SPB prevention thinning project was funded in 2003-2004 to encourage landowners to reduce the SPB hazard rating of their stands. A new SPB Prevention project is being funded for 2005-2006 to encourage that additional stands be rated and the hazard reduced. The acceptance of the idea that SPB damage can be prevented has been a slow concept for some landowners to buy into. There is one issue that keeps recurring: Is it economical to thin a pine stand to reduce the SPB

hazard? The following is a discussion of the importance of SPB prevention by thinning your pine stand, viewed from an economic perspective.

The level of susceptibility of pine stands to attack by the Southern Pine Beetle is a result of the interaction of stand variables such as site index (how productive the site is), age, stocking level (number of trees per acre), site competition, and cultural practices. All of these variables contribute to the single-most important factor in a pine stand's susceptibility to SPB attack: stand vigor. In the absence of injury due to cultural practices or weather, stand vigor is influenced primarily by the basal area present on a given site at a given time.

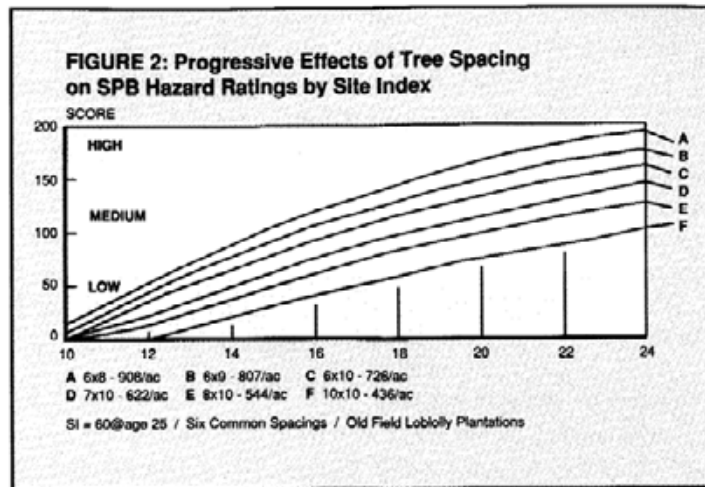
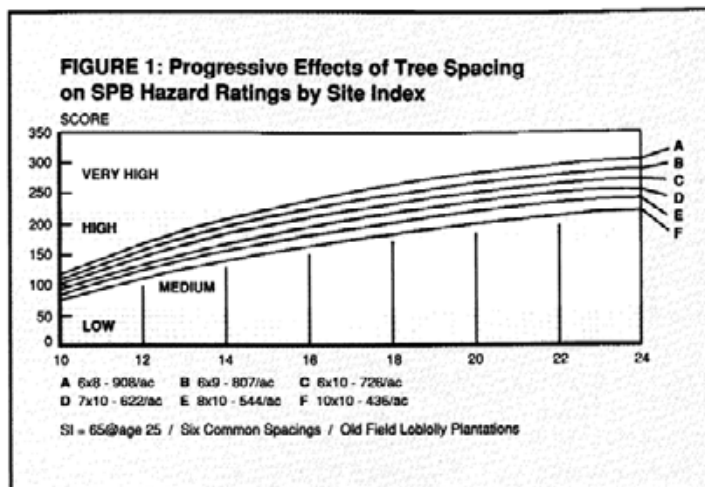
The initial stocking level plays an essential part in determining stand basal area at any time during the stand's rotation. It therefore plays an essential part in the susceptibility of pine stands to SPB attack as the stands progress through time.

Low initial stocking levels can prolong the entry of pine stands into preferred sites for SPB attack. But is it economically feasible, in terms of stand productivity and financial return, to use lower initial stocking levels?

As demonstrated by the graphs of SPB susceptibility in Figures 1 and 2, when initial stocking levels increase, the following can be observed: 1) stands enter hazard categories at earlier ages relative to stands on the same site but at lower initial stocking levels, and 2) the degree of hazard within a certain hazard rating is more pronounced than for stands on the same site at the same point in time.

These two occurrences relate, on the ground, to a higher risk of attack by the SPB as initial stocking levels increase. Likewise, the severity of infestations can be more pronounced in stands of higher initial stocking levels due to the more widespread occurrence of trees susceptible to attack. For a forest landowner, this could lead to unplanned activities detrimental to the overall profitability of the stand.

For example, on highly productive old field sites where the SPB hazard reaches concerning levels at early ages, an infestation can occur before trees are of merchantable size. Therefore, the landowner could be forced to salvage (at a reduced stumpage price) or cut and leave the infested portion of the stand in order to control the outbreak. Furthermore, the





situation could dictate a complete pre-commercial thin in order to reduce the risk of further loss. Often this is not a desired cultural practice within the financial framework of a forest landowner, particularly when cash flow is considered.

By using lower initial stocking levels in appropriate situations, the chance of this type scenario occurring can be greatly reduced. This reasoning makes a very good argument for using low initial stocking levels in reducing SPB hazard of stands, but is it economically feasible?

ECONOMIC FEASIBILITY

Economic feasibility is based not only on the product you are growing, but also the landowner's management objectives (pulpwood company feeding a mill, a Tree Farmer, a sawmill company, a multiple-use landowner, a TREASURE Forest, or a combination of any of these). In this article we are using pulpwood production and chip-n-saw as objectives. Comparisons were made using the Mississippi B SPB Hazard Rating System (Nebaker and Honea 1984) and YIELDplus with SMART version 2 (TVA, 1990).

As seen in the comparisons, for instance, where fiber production is the objective, higher initial stocking levels make the best use of most all sites on shorter rotations with no merchandising possible or planned at the time of harvest. This results from the higher yield in terms of cords produced per acre over the rotation. However, based on economic

indicators, when product merchandising is implemented, certain sites perform better at lower initial stocking levels.

Table 1 is the comparison of different number trees per acre, rotations, products, and economic indicators. For simplicity, we will use Annual Equivalent Value (AEV) as a factor to determine if lower spacings are economical.

Although in most instances the economic indicators support the use of the higher initial stocking levels for pulpwood rotations, the AEV offers a more graspable interpretation of the difference between the initial stocking levels in terms of profitability. The AEV expresses the Net Present Worth (NPW) in terms of annual per acre payment (in 1990 dollars). This figure can be used in more comprehensible fashion. By comparing the difference in AEV between the various initial stocking levels for the same set of circumstances, with the difference in SPB hazard between the same initial stocking levels, an idea of the validity of using one initial stocking level over that of another can be more readily evaluated.

For example, in Table 1A the AEV for 908 trees per acre for a 25-year pulpwood rotation with no chip-n-saw market is \$18 per acre. The AEV for 436 trees per acre is \$19. Comparing this benefit to the difference in SPB hazard rating (Figure 1) for the 25-year period, we see that another benefit afforded by 436 trees per acre over 908 trees per acre is

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TABLE 1. ECONOMIC COMPARISON OF SIX COMMON TREE SPACINGS
Pulpwood Rotations of 20 and 25 Years with Product Merchandising
Old-Field Loblolly Sites
Site Index: 65 @ Age 25

A. Pulpwood and Sawtimber Product Merchandising

Trees/Acre	Age 20			Age 25		
	NPW	AEV	IRR	NPW	AEV	IRR
908	\$255	\$21	13.2%	\$264	\$18	11.7%
807	\$248	\$20	13.4%	\$252	\$18	11.9%
726	\$247	\$20	13.7%	\$256	\$18	12.2%
622	\$246	\$20	14.0%	\$262	\$19	12.5%
544	\$244	\$20	14.3%	\$267	\$19	12.8%
436	\$241	\$19	14.7%	\$267	\$19	13.2%

B. Pulpwood, Chip-n-Saw, and Sawtimber Product Merchandising

Trees/Acre	Age 20			Age 25		
	NPW	AEV	IRR	NPW	AEV	IRR
908	\$413	\$33	15.4%	\$421	\$30	13.4%
807	\$407	\$33	15.7%	\$405	\$29	13.6%
726	\$405	\$33	16.0%	\$397	\$28	13.7%
622	\$397	\$32	16.3%	\$385	\$27	13.9%
544	\$383	\$31	16.5%	\$371	\$26	14.0%
436	\$368	\$30	16.7%	\$361	\$26	14.4%

Note: All values are per acre.

NPW: Net Present Worth / AEV: Annual Equivalent Value / IRR: Internal Rate of Return

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reduced SPB hazard throughout the rotation. This information should offer few questions as to the most suitable stocking level to use.

In Table 1B, comparing the same two initial stocking levels but implementing an existing chip-n-saw market, we see that 908 trees per acre has an AEV of \$30 per acre while 436 trees per acre has an AEV of only \$26 per acre. Immediately the increased revenue leans towards the use of the higher initial stocking level. By referring to the SPB hazard rating (Figure 1) for the two stocking levels we see again the lower hazard afforded by the lower initial stocking level.

IS IT WORTH THE RISK?

The question to be asked is whether or not the increased risk of SPB attack and potential value loss is worth the potential increased revenue. More precisely, is \$4

per acre per year worth the added risk associated with the higher initial stocking level? In relevant terms, \$4 per acre per year is roughly less than the loss of ten, 5" DBH, 30-foot pine trees. Questions such as these must be evaluated by the prescribing forester and landowner.

The sawtimber rotations reveal the same total volume (total cords produced per acre over the entire rotation) trend as does the pulpwood rotations. The only exception is that although total volume is less in the lower initial stocking levels, the volume in MBF per acre produced increases as the initial stocking level decreases. For old-field sites under the rotation and parameters used in this comparison, the advantage of using lower initial stocking levels is expressed through all of the economic indicators and compounded by the lower SPB hazard ratings for the periods preceding the first thinning at age 15.

Cutover sites, however, are not as pronounced, yet are relatively constant with the middle range of initial stocking levels providing the better of the economic indicator levels. Again, the economic indicators compared with the related SPB hazard can offer insight in making the proper initial stocking level decisions.

SUMMARY

Initial stocking levels play an important role in the level of susceptibility of stands to attack by the SPB. Low initial stocking levels can reduce the rate at which stands progress into preferred sites for SPB attack. Although higher initial stocking levels often produce more pure volume (cords, tons, etc.) per acre, the true economic feasibility must be evaluated for each site and management objective. This, combined with an evaluation of the progressive effects of initial stocking levels on the level of susceptibility of stands to SPB attack, can allow for accurate decision making.

Low initial stocking levels can offer lower risk during the pre-merchantable phases of stand development, lower levels during the merchantable phases, and under the proper site conditions can offer greater financial return. ♣

REFERENCE:

"How to Grow Beetle Bait,"
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on the
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Beetle
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